

First record of a phoretic association between a hoverfly (Diptera, Syrphidae) and a pseudoscorpion (Arachnida, Pseudoscorpiones) in the Iberian Peninsula

Primer registro de una asociación forética entre un sírfido (Diptera, Syrphidae) y un pseudoescorpión (Arachnida, Pseudoscorpiones) en la península ibérica

Hoverflies act as phoretic agents of mites (Acarina) (e.g. FASHING, 2010) and triangulin larvae of Meloidae (Coleoptera) (e.g. MARCOS-GARCÍA & MORENO-FRESNEDA, 2012). Phoretic associations between hoverflies and pseudoscorpions are known for *Lamprochernes nodosus* (Schrank, 1803), which is being reported in association with three hoverfly species, *Brachypalpus laphriformis* (Fallén, 1816), presumably in Middle Europe (GERSTÄCKER, 1859), *Eristalis arbustorum* (Linnaeus, 1758), in the UK (JONES, 1978) and *Volucella zonaria* (Poda, 1761), in France (BERLAND, 1932). The pseudoscorpion *Anthrenochernes stellae* Lohmander, 1939 has also been reported as phoretic of the hoverfly *Myathropa florea* (Linnaeus, 1758) in Germany (SSYMANK & MUSTER, 2010). In the review by POINAR *et al.* (1998), a phoretic association between *L. nodosus* and *Sargus iridatus* (Scopoli, 1763) (Diptera, Stratiomyidae) is reported (JONES, 1978), but *S. iridatus* is in that review erroneously assigned to the Syrphidae.

There are 10 known families of phoretic pseudoscorpions (POINAR *et al.*, 1998), two of which, Chernetidae and Cheliferidae, are the most frequently recorded (LEGG, 1975); for example, some Chernetidae are transported by flies such as *Musca domestica* (Muscidae) (NAVÁS, 1918), while some Cheliferidae are transported by saproxylic longhorn beetles (Cerambycidae) (DOMÍNGUEZ *et al.*, 2008). A total of 44 families of insects and three of arachnids are involved in phoretic associations with pseudoscorpions (POINAR *et al.*, 1998). Knowledge of phoretic associations between Iberian pseudoscorpions and other arthropods is poor (DOMÍNGUEZ *et al.*, 2008), even though a phoretic association between a species of Noctuidae (Lepidoptera) and a pseudoscorpion has recently been reported from Almería province, Spain (MAGRO, 2013).

For the present study, collecting took place in a typical Mediterranean dehesa of *Quercus rotundifolia* L., 'Dehesa de San Francisco', in Santa Olalla del Cala, Huelva, Spain (37.878429, -6.236206), on 21 May 2016. The collecting site was a slight slope, near a virtually-dry stream. The site vegetation consisted of grasses of different species including a flowering yellow Apiaceae, which was present at high density. There were also over-mature *Q. rotundifolia* trees at the site. Dipterans of different families were present in numbers on the flowers of this Apiaceae, including many hoverflies. The following hoverfly species were collected with hand net: *Ceriana vespiformis* (Latreille, 1809) (1♀), *Chrysotoxum intermedium* Meigen, 1822 (3♀), *Eumerus pusillus* Loew, 1848 (1♂, 1♀), *Myolepta difformis* (Strobl, 1909) (2♂, 2♀), *Myolepta dubia* (Fabricius, 1805) (3♀) and *Riponnensia splendens* (Meigen, 1822) (1♂) (Antonio Ricarte leg.). Hoverflies of the genus *Myolepta* were remarkably abundant at the collecting site. In other similar Mediterranean ecosystems of Spain such as Cabañeros national park, in Ciudad Real and Toledo provinces, *Myolepta* adults have been rarely observed in spite of long and intensive history of hoverfly studies (RICARTE, 2008).

One of the collected females of *M. dubia* carried two pseudoscorpions attached to the apical part of the legs, one at each leg. Pseudoscorpions were brought to the lab, killed by freezing (same as for the collected hoverflies) and then conserved in alcohol. The two pseudoscorpions were identified as females of *Pselaphochernes lacertosus* (L. Koch, 1873) (Chernetidae). These data represent the first documented association between a hoverfly and a pseudoscorpion in the Iberian Peninsula.

Pselaphochernes lacertosus is recorded in different Spanish provinces and islands (ZARAGOZA, 2007) and was already known from the province of Huelva, where it has been found in the most internal parts of wood in stumps. Muscids (Diptera) have also been observed with attached *P. lacertosus* specimens in the Botanical Garden of Valencia (DOMÍNGUEZ *et al.*, 2008). The present study provides an evidence of phoretic activity by *P. lacertosus* in a saproxylic microhabitat, since the larvae of *M. dubia* develop in wet rot holes of various tree genera (e.g. DUSSAIX, 1997; RAMÍREZ-HERNÁNDEZ, 2014), as well as in water-filled cavities beneath the bark of mature trees (SPEIGHT, 2015). The studied females of *P. lacertosus* may had attached to the hoverfly when emerging from any of these two saproxylic microhabitats, since *P. lacertosus* is also considered to be a bark-related species (ZARAGOZA, 2007).

Hoverfly and pseudoscorpion specimens are deposited at the collection of CIBIO Research Institute, 'Colección Entomológica de la Universidad de Alicante (CEUA)'.

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